Simulation-dynamic model for calculating the equipment leasing

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Abstract. The article presents a simulation-dynamic model for calculating leasing payments for leased equipment. The model was developed based on the system dynamics method using Powersim Studio tools. In the model, the calculations were carried out for financial leasing, regressive payment schedule and the method of minimum deductions. The model was used as a tool to study options for leasing payments with linear and non-linear deprecation methods, with a multiplying factor-accelerated depreciation. As a result of experiments with options, various amounts of leasing payments (depreciation, loan payments, commission fees, total leasing payments, etc.) were received. The conducted study allows us to conclude that the constructed simulated dynamic model is quite universal and on its basis, it is possible to carry out a variety of studies concerning various aspects of equipment leasing.

1. Introduction

The production of machinery and equipment is a leading sector of the global industry, the state of which determines the economic development of the country. To date, the production of machinery and equipment in Russia has encountered a number of problems. The main problems are: the unsatisfactory condition of fixed assets, the increase in the cost of products, the decline in its quality and profitability. All of these problems lead to a determination in the overall financial condition of enterprises [1].

The main problem of the non-competitiveness of the production of machinery and equipment in Russia is obsolete fixed assets with high both moral and physical determination. [2]

Such a situation with fixed assets does not allow mastering high-tech and high-tech products, and does not improve its quality.

According to most experts, one of the main causes of this problem is the lack of investment resources both in industry as a whole and in the production of machinery and equipment [3, 4]. Experts believe that this problem can be solved by using a specific form of lending (long-term lease) for equipment purchase by enterprises — leasing [5, 6]. Equipment leasing is one of the most profitable ways of financing, which allows an enterprise to increase production, to build new workshops, to update technologies by purchasing technical innovations without cost, which will lead to an increase in profits [7 - 9].

Today, investment managers of industrial enterprises are faced with the need to determine the type of leasing, the schedule and method of charging leasing payments, the deprecation method before deciding on the acceptability of one of them or their combination when calculating leasing payments.

The need to take into account the influence of these factors predetermines the use of instrumental methods of management, such as economic and mathematical modeling (EMM), which increase the effectiveness of equipment leasing decisions. One of such modern and widely used approaches today is simulation-dynamic modeling, the method of system dynamics [1].

2. Financial lease calculation model

The model for calculating the total amount of leasing payments is presented in Figure 1.

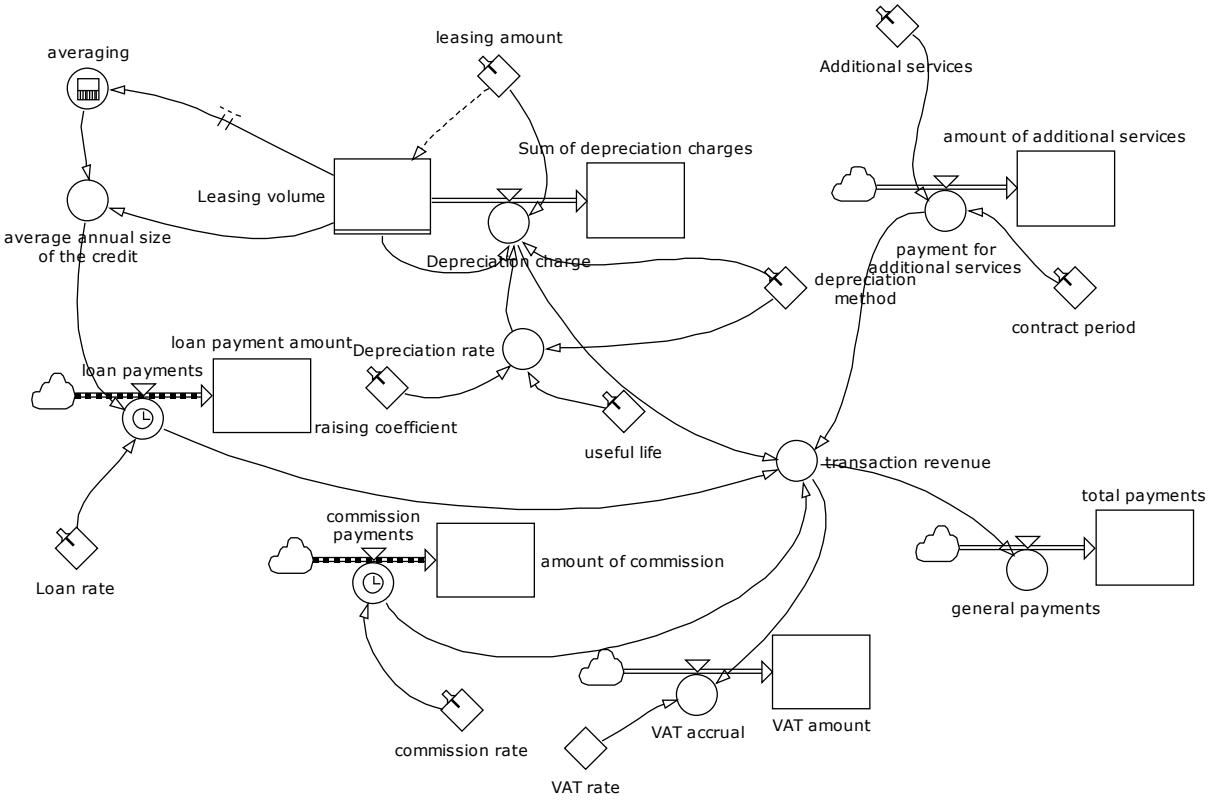

Figure 1. Flow chart and calculation levels for financial leasing payments.

The model includes seven levels (drives):

- Leasing volume.
- Sum of deprecation charges.
- Loan payment amount.
- Amount of commission.
- Amount of additional services.
- VAT amount.
- Total payments.

Also, the diagram shows six streams:

- Deprecation charge;
- Loan payments;
- Commission payments;
- Payment for additional services;
- VAT accrual;

- General payments.

Consider the algorithm for calculating the lease payments for each of the components.

The model uses the financial type of leasing. The term of the lease agreement is similar to the useful life of the equipment. Usually at the end of the agreement, the residual value of the equipment approaches zero. The object in this case can become the property of the recipient at no additional charge. Financial leasing is considered one of the most common ways to attract targeted funds.

Selected regressive payment schedule. According to this schedule it is stimulated that the monthly amount decreases during the lease term.

When calculating the amount of lease payments are taken into account:

- Deprecation of the object for the entire period of the agreement.
- Compensation of the lessor's payment for the credit funds used by it.
- Amounts transferred for the provision of additional services by the lessor, as specified in the contract.
- Commission remuneration.
- The cost of the object to be redeemed, if the agreement provides for an appropriate procedure and procedure for paying this price in parts as part of leasing payments.

The method of minimum deductions is chosen as the method of calculating leasing payments. In this case, the total amount includes the property deprivation for the entire contract period, payment for the use of borrowed funds, commission, as well as payment for additional services specified by the parties to the contract and the cost of the property to be repurchased (if established by the parties to the transaction). [10]

The model has implemented depression by two methods: linear and nonlinear. According to clause 4 of Article 259 of the Tax Code of the Russian Federation, when applying the linear method, the amount of deprivation adjusted over one period in respect of the depreciable property is determined as the product of its initial (replacement) value and the deprivation rate determined for this object. When applying this method, the depreciation rate for each object of depreciable property is determined depending on the useful life of the equipment. In the case of a non-linear deprecation method, the amount of accumulated depreciation during each calculation period is correlated with the average annual residential price of equipment. The depreciation rate is determined in accordance with article 259.2 of the Tax Code. The possibility of depression under the accelerated scheme is also provided, with the use of a multiplying factor [11].

The fee for the credit resources used by the lessor for the acquisition of the leased asset is calculated on the basis of the average annual residential value of the equipment.

The lessor's remuneration is determined as a percentage of the average annual residential value of the property. Note that in this case, the removal is calculated for each year of the lease agreement, and then summed up.

The total amount of payment for the additional services of the lessor, which is part of the lease payments, is determined by summing up the expenses of the leasing company for all the additional services provided to the lessee.

3. Interface for managing the model of financial leasing payments

Figure 2 shows the control interface of model of payments calculation on financial leasing. The interface structure consists of two parts: input of input data and monitoring of calculation results.

Before starting the calculation, the following data are entered:

- Volume of leasing (160.000.000 Roubles).
- Depreciation method and coefficient of increase of depreciation (method – linear or not linear; coefficient – from 1 to 3).
- Set the useful life of the equipment and the term of the lease agreement.

- Value of the coefficient, the useful life and the term of the agreement is calculated depreciation rate.
- Rate on the loan, determined by the cost of additional services and the rate of commission payments.

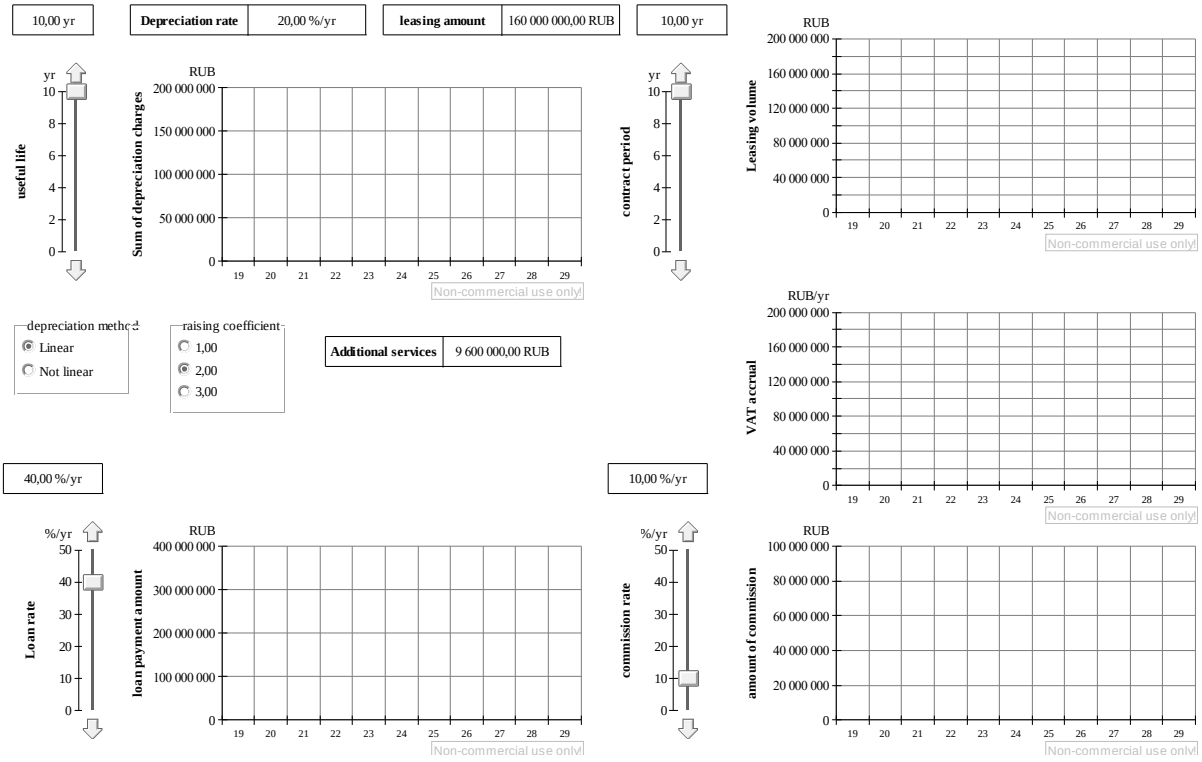

Figure 2. Financial leasing calculation model control panel.

The second part of the interface displays the calculation results in a graphical form: depreciation, loan charges, VAT, commission payments and regressive changes of the volume of leasing.

4. Results

During the experiment, the payments calculations on financial leasing were made on the following initial data:

- Price of the object - 160 million roubles.
- Agreement is issued for 10 years.
- Depreciation method is linear and not linear.
- Loan rate - 40 % per year.
- Commission fee - 10% per annum.
- Additional services - 9.6 million roubles.
- VAT - 20 %.
- The useful life of the equipment - 10 years.

From the graphs (Figure 3) it can be seen that with the linear depreciation method and the regression payment schedule, the decrease in the amount of the lease debt is the same with the linear dependence. Payments on the loan and the commission fee are carried out according to the logarithmic dependence, since they are calculated from the average residual value of the equipment. So, the total leasing fees also represent a logarithmic dependence.

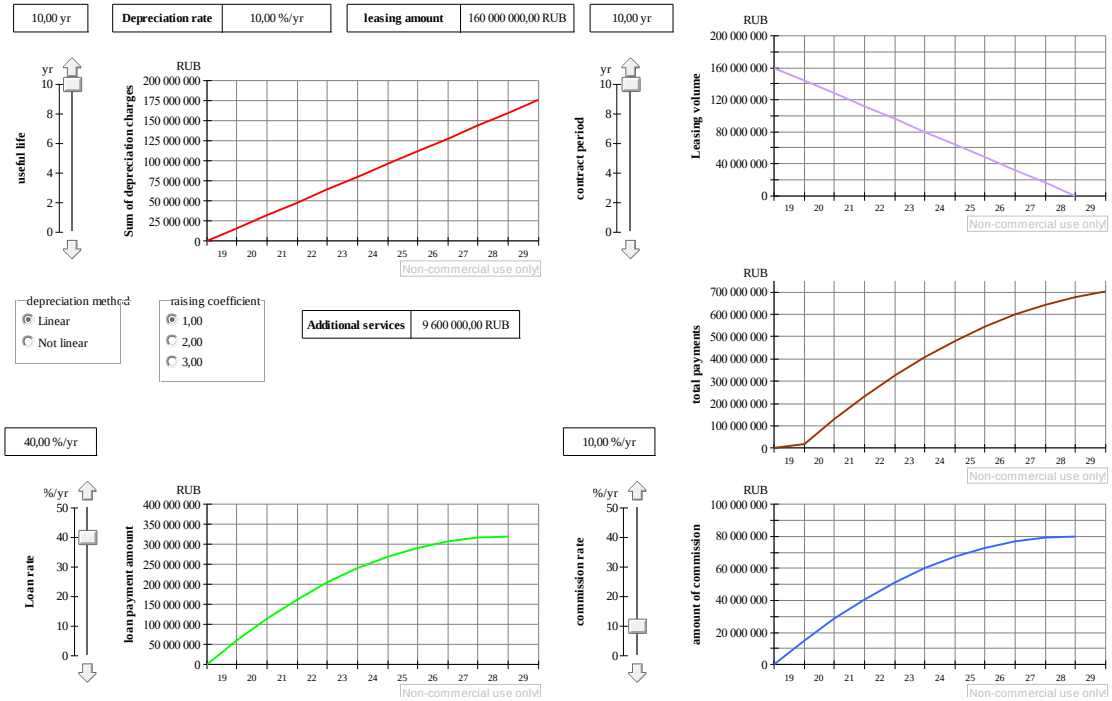

Figure 3. Results of the payments calculation on financial leasing with the linear method of depreciation.

As can be seen from the following graphs (Figure 4) in the nonlinear depreciation method, the depreciation schedule is a logarithmic function, since the calculation of depreciation is carried out by the method of decreasing balance, the amount of depreciation is maximum in the first years of the lease, and then significantly reduced.

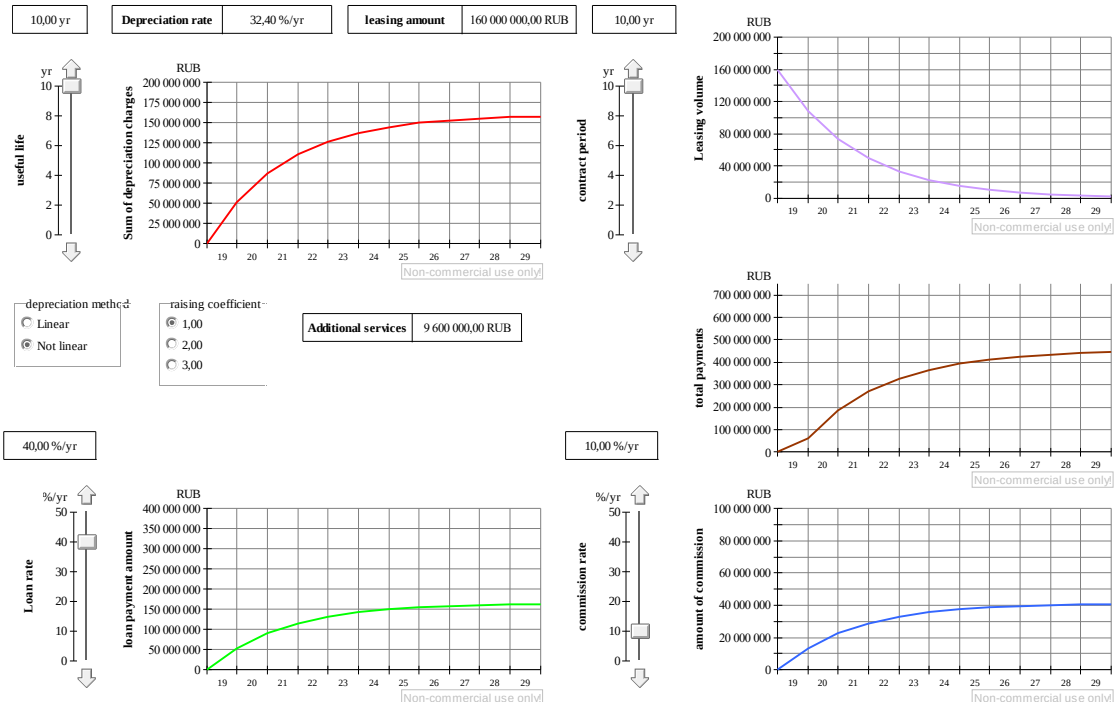

Figure 4. Results of the payments calculation on financial leasing with the non-linear method of depreciation.

So, the amount of loan payments, the commission free and the total payments for leasing turns out twice less, than when using the straight-line method of depreciation. Reduction of the amount payable under the lease occurs according to an exponential function, inverse logarithmic.

5. Conclusion

As a result, based on the calculations carried out, it can be concluded that the best option for financial leasing of equipment is the option that uses the method of nonlinear depreciation. Since the amount of lease payments: on the loan, commission free and the total amount is twice lower than the linear depreciation method.

It should also be noted that the built simulation model of financial leasing of equipment can be used to calculate the leasing of real estate and vehicles in this regard, it can be considered universal.

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